IV. ECONOMIC EFFICIENCY ANALYSIS

This section explains the concepts and defines the costs and benefits involved in economic efficiency analysis, how the values were derived, and how they were used in the Forest planning process. Economic efficiency analysis is required by the National Forest Management Act Regulations (36 CFR 219) and played an important role in the development and evaluation of Forest planning benchmarks and alternatives Specifically, the Regulations (36 CFR 219.12(f)) state that.

> "The primary goal in formulating alternatives, besides complying with NEPA procedures, is to provide an adequate basis for identifying the alternative that comes nearest to maximizing net public benefits."

Additionally, 36 CFR 219.12(F)(8) states·

> "Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative."

A. DESCRIPTION OF CONCEPTS

Before explaining the specifics of how economic efficiency analysis was used in the development of the Malheur National Forest Final Environmental Impact Statement and Forest Plan, a few concepts and terms related to efficiency analysis in general need to be explained

1. Priced Outputs

Priced outputs are goods or services which can be exchanged in the market place. The quantitative values are determined by actual market transactions or by estimation methods that produce prices commensurate with those determined by market transactions. Timber, forage, and minerals are examples of commodities which are bought and sold in the market. Their values are determined through the interaction of buyers and sellers based on the supply and demand conditions in the market at the time of the transaction. Recreation Visitor Days, on the other hand, are not normally exchanged by market transactions. Their market values are estimated by using some market transaction data in combination with various theoretical techniques. Conceptually, these assigned values should be consistent and comparable to those values which were actually derived by market transactions (Rosenthal et al 1985). Therefore, both assigned and market values for priced outputs are appropriate to use for calculating quantitative measures of efficiency such as present net value.

2. Nonpriced Outputs

Nonpriced outputs are outputs which have no available market transaction evidence and no reasonable basis for estimating a dollar value commensurate with the market values associated with the priced outputs. This situation requires that subjective noncash values be attributed to the production of the outputs The values are qualitatively rather than quantitatively described They may be either positive or negative. What may be considered to be a benefit to some may represent a cost to others. Examples of nonpriced outputs include the maintenance or enhancement of threatened and endangered species, natural and scientific areas, historical and anthropological sites, visual quality, and clean air. The outputs are also referred to as nonpriced indicators of responses to issues, concerns, and opportunities for the benchmarks and alternatives

3. Discounting

Financial analyses of alternative investment options usually involves cash flows over different periods of time in the future Inherently, there is a time value associated with money; a dollar today is worth more than a dollar 10 years from now. Discounting is a process for adjusting the dollar values of costs and benefits which occur at different periods in the future to dollar values for a common time period so they may be compared Usually the common time period is the present, then the discounted cash flow is referred to as the present value

4. Present Net Value

Present net value is the difference between the discounted value (benefits) of all outputs to which monetary values or established prices are assigned and the total discounted costs of managing the planning area. The maximization of present net value was the criterion used to help ensure each alternative was the most economically efficient combination of outputs and activities needed to meet the objectives established for the alternative Present net value calculations consider only the benefits for which market prices exist or can be assigned. On the Malheur National Forest, the priced benefits included timber, recreation, wildlife, fisheries and water quality, and range The benefits were compared against all Forest Service fixed and variable costs associated with managing the planning area, regardless of whether the costs were incurred for the production of either priced or nonpriced outputs, or as overhead expenses for general maintenance of the organization. Therefore, present net value is an estimate of the current market value of the priced forest resources after all costs of producing both priced and nonpriced outputs and meeting other multiple-use objectives have been considered.

5. Opportunity Costs

Opportunity costs are defined as the value of a resource's foregone net benefit in its most economically efficient alternative use (Forest Service Manual 1970.5). In relation to the economic analysis performed for Forest planning, it represents the decrease in maximized present net value of an alternative when some alternative level of resource outputs is forced into solution Therefore, opportunity costs measure the change in present net value for priced resource outputs, and can be used to measure the relative value traded off in order to produce the nonpriced benefits included in net public benefits In the opposite sense, increasing the priced (market, timber, etc) outputs through a series of higher levels, will also show the physical tradeoffs imposed on non-market outputs.

6. Net Public Benefits

The maximization of net public benefits is a goal of the Forest planning process Net public benefits are the overall value to the nation of all outputs and positive effects (benefits) less all the associated Forest Service inputs and negative effects (costs) whether or not they can be quantitatively valued Net public benefits cannot be expressed as a numeric quantity because they include qualitatively valued nonpriced outputs.

Conceptually, net public benefits are the sum of the present net value of priced outputs plus the full value of all nonpriced outputs. The full value of nonpriced benefits is used because the costs associated with their production is accounted for in the calculation of present net value Marginal values of nonpriced outputs should be identified when management inputs are increased in order to provide the outputs at levels above current standards or legal requirements. In such cases, it is important to depict the physical, biological, and social dimensions of the nonpriced outputs, as well as who will be affected by changes in their production Account should also be taken of any changes occurring among the other nonpriced outputs as a result of providing a particular nonpriced output

In assessing the net public benefits of a particular alternative, nonpriced indicators should be evaluated to determine if their value to society exceeds the opportunity cost of their production.

7. Welfare Distribution Effects and Impacts

Another level of effects which are a concern of National Forest policy and management are the welfare distribution effects influenced by the mix and level of outputs produced by the National Forest. These effects can be either positive or negative. The impacts can also be local, regional, or national in scope. Some distributive effects such as changes in consumer prices or taxpayer costs have national level impacts. Others, such as induced jobs and income or payments in lieu of taxes are more local or regional in nature. The effects are more related to questions of equity (i e., who pays and who benefits) rather than efficiency and are not assessed in the context of the efficiency criteria associated with the present net value and net public benefit concepts.

However, the positive and negative distributive effects need to be assessed in conjunction with the net public benefit measures since equity objectives often influence efficiency objectives and vice versa The distributive effects will be discussed in more detail in Section V

B. PARAMETERS AND ASSUMPTIONS USED FOR ECONOMIC EFFICIENCY ANALYSIS

In order to calculate the present net value for each alternative, several assumptions were made regarding discount rates, demand curves, real dollar adjustments, and real price and cost trends. This section will summarize the decisions and the resulting parameters A more detailed discussion can be found in various process records in the Supervisor's Office.

1. Discount Rates Used

Discounting requires the use of a discount rate which represents the cost or time value of money in determining the present value of future costs and benefits One discount rate was used to calculate the Present Net Value for each benchmark and alternative. A real discount rate was used, meaning it was adjusted to exclude the effects of inflation (real dollar adjustments will be discussed more below).

For evaluations of long-term investments and operations in land and resource management in the 1986-1995 planning period, a 4 percent real discount rate was used as directed by the Washington Office. The 4 percent rate approximates the "real" return on corporate long-range investments above the rate of inflation (Row et al., 1981). The 4 percent rate was used to solve FORPLAN and calculate the Present Net Value for each benchmark and alternative An analysis of the sensitivity of the alternatives to the discount rate was performed by using a discount rate of 7-1/8 percent All costs and benefits were discounted from the midpoint of the decade in which they were incurred.

2. Demand Curves and Real Price Trends

As specified by the Washington Office (1920 letter to the Regional Forester, February 3, 1981 "Downward Sloping Demand Curves,") and FSM 1971 65, horizontal demand curves for timber and nontimber resources were used to analyze the benchmarks and alternatives for the Draft Environmental Impact Statement Many factors can influence the demand for stumpage from any one Forest (Adams et al., 1985). Some of the factors include trends in (1) interest rates, (2) the species and products mix of forest products consumption, (3) use of wood for energy, (4) forest products exports, (5) the cost of wood in Canada, (6) the rate of technical improvements in wood and fiber processing, and (7) the harvest levels of other National Forests and private timber owners

All of the factors contain some degree of uncertainty regarding their future disposition and effect Neither the empirical nor the theoretical bases have been well enough developed to derive reasonable estimates of the demand functions for the resources offered at the Forest level. For purposes of the analysis conducted here, the assumption was made that the amount of total timber offered would not affect the prices paid. In other words, the timber demand curve for the range of output levels analyzed during the development of alternatives is best depicted by a horizontal demand function.

As a surrogate for resource demand curves, real price trends were developed and used to represent the rate at which resource values will change over time as a result of anticipated supply and demand interactions in the market place. As specified by the Regional Office (1920 letter to Forest Supervisors, September 25, 1984 "Timber Price Trends, Values, and Costs"), a 1 percent per year real price trend for stumpage was used for FORPLAN harvest scheduling analyses These were applied for the first 50 years, and then a 0 percent price trend was assumed for the remaining 100 years of the harvest scheduling planning horizon. These imply that nominal stumpage prices (i.e., those which include the effects of inflation) will increase during the next 50 years at a rate 1 percent greater than the rate of inflation, and equal to the rate of inflation thereafter.

Since price trends are reflections of expected futures, there is an inherent uncertainty involved with making such projections In recognition of the uncertainty, a sensitivity analysis was performed by using alternative stumpage *price trends of 0, 2, and 3 percent. The results of the runs indicate that,* generally, higher price trends make silvicultural investments economically more attractive

A 0 percent real price trend for all other resources were used during the development of the benchmarks and the alternatives In other words, their future nominal values will change at rates equal to inflation.

3. Real Cost Trends

A 0 percent real cost trends were used for all future costs used in the development of the benchmarks and alternatives That is, the costs of labor, fuels, materials, and all other factors of production involved with managing the Forest are assumed to change at a rate equal to the rate of inflation

4. Real Dollar Adjustments

Future prices and costs can be expressed in both nominal and real terms. The projection of nominal values includes the effects of inflation on the values For example, assume future prices for commodity "XYZ" are projected to increase annually by 8 percent Also assume the rate of inflation is anticipated to be 5 percent. In real terms, the prices are increasing by only 3 percent per year above and beyond the rate of inflation (whereas the nominal value change would be 8 percent) Real value changes are the result of the interactions of supply and demand forces in the market place and do not include the effects of inflation

All future values and costs used in the Forest planning process were expressed in real 1982 dollars, consistent with the 1985 Resource Planning Act program The Gross National Product implicit price deflator index was used to convert both historical and future nominal prices and costs to the common base (Forest Service Manual 1971 32b)

C. COSTS USED FOR ECONOMIC EFFICIENCY ANALYSIS

This section describes the costs used to perform economic efficiency analysis for each of the benchmarks and alternatives considered during the development of the Draft and Final Environmental Impact Statements. All Forest Service costs were included for purposes of estimating budgets and calculating Present Net Values for each alternative. In the Draft Environmental Impact Statement, the costs were identified by their Management Information Handbook codes as described in Forest Service Handbook 1309.11. The Management Information Handbook activity descriptions and their associated codes were useful for identifying how different costs would be treated during the planning process All costs were categorized as either fixed or variable and as either a capital investment or an operational or maintenance cost. If a cost was identified as a variable cost, a decision was made as to whether it would be analyzed in FORPLAN.

All variable costs not included in FORPLAN and all fixed costs were analyzed using the a spreadsheet simulating the ADVENT system. This system was also used in the accounting of capital investments and operation and maintenance costs Costs were determined by examining: (1) ADVENT Resource Planning Act budget planning files, and (2) historical records and contracts. Professional judgment was also an important factors in making assumptions regarding what bearing historical costs had on anticipated future costs All costs were developed and reviewed by the Forest Economist, the Forest Management Team, and the appropriate staff personnel. In the following discussion, the cost breakdowns and how they were incorporated into the efficiency analyses for each alternative are discussed.

Since publication of the Draft Environmental Impact Statement and the Proposed Forest Plan (1987), fixed and variable costs used for economic efficiency analysis have been updated. The updating of costs resulted in higher costs for some activities from what was displayed in the Draft Environmental Impact Statement for all alternatives and benchmarks As a result, Present Net Value has changed for all alternatives, and several of the benchmarks However, the relationships among the alternatives have not changed as a result of the cost updates.

1. Fixed Costs Considered

A cost was classified as "fixed" if the cost:

a. Was not expected to vary significantly over the range of alternatives considered;

b. Could not be tied to specific activities within any of the prescriptions;

c. Represented a very small and insignificant amount of the Forest budget; or

d. Was not related to the production of outputs and effects which were relevant to addressing the Forest planning issues.

Fixed costs were a component of the budget estimates and Present Net Value calculations for each alternative

Table B-10 summarizes Malheur National Forest budget costs considered in the economic efficiency analysis and calculation of alternative budgets. In this table, the fixed costs are those displayed as "varying insignificantly " Some costs may vary between the alternatives; however, the costs did not vary over time and had no influence on the assignment and scheduling for any given alternative The cost estimates were derived using professional judgment and experience based on the goals and objectives of each alternative, and the estimates were included in the spreadsheet to calculate an appropriate Present Net Value for each alternative.

2. Variable Costs Considered

All other costs used in the economic efficiency analysis were classified as "variable " These costs are identified in Table B-10 as "varying significantly." The costs were tied to the implementation of activities within a FORPLAN prescription or to scheduled activities outside FORPLAN, and were expressed as costs per acre or costs per unit of output (i e., dollars per thousand cubic feet, etc)

In general, FORPLAN contained all of the variable costs associated with implementing timber and range management activities, and most local road construction and reconstruction costs incurred to access roadless areas or upgrade existing roads The model also contained some nonfederal logging costs The nonfederal costs were included in FORPLAN's Present Net Value calculations, but did not influence the Forest Service budget estimates Table B-11 depicts the Forest's variable costs included in FORPLAN or in the spreadsheet which contributed to the calculation of Present Net Value for each alternative.

Table B-11 lists the FORPLAN activity codes for which costs were developed and entered into FORPLAN The costs were usually expressed in terms of dollars per acre or dollars per thousand cubic feet Logging costs were deducted from timber benefit values and were not diameter specific For each FORPLAN cost category, an average cost or a range of costs were entered into the model based on the management prescriptions and the characteristics of the analysis areas to which the costs applied The table presents some broad FORPLAN cost categories, the units for which the costs were based, and the costs included in the model.

3. Capital Investments and Operation and Maintenance Costs

All costs were categorized as either capital investment expenditures or operation and maintenance costs using the professional judgment of Forest personnel. In general, capital investments are one-time expenditures of funds for specific projects (e.g , road construction, recreation construction, timber stand improvement, or range improvements) while operation and maintenance costs are either continuous or periodically recurring (e g., administrative costs of keeping offices open, periodic maintenance of Forest improvements, etc).

TABLE B-10

COSTS CONSIDERED IN ECONOMIC EFFICIENCY ANALYSIS

Cost Item	Inside FORPLAN	Outside FORPLAN	Significant Variation	Insignificant Variation	Capital Investment	Operations and Maintenance
Recreation Planning		X	X		X	
Recreation Inventory		X		X	X	
Cultural Resource Evaluation & Assessments		X		X		X
Cultural Resource Protection & Enhancement		X		X		X
Facility and Site Reconstruction		X	X		X	
Facility and Site Construction		X		X	X	
Facility and Site Management		X	X			X
Recreation Use Administration		X	X			X
Trail Reconstruction		X	X		X	
Trail Construction		X	X		X	
Trail System Maintenance and Operation		X	X			X
Wilderness Planning		X	X		X	
Wilderness Inventory		X		X	X	
Wilderness Use Administration		X		X		X
Wildlife and Fish Surveys, Planning, etc.		X		X		X
Nonstructural Habitat Improvement		X	X		X	
Structural Habitat Improvement		X	X		X	
Structural Habitat Maintenance		X	X			X
Range Planning		X		X		X
Range Inventory		X		X		X
Range Nonstructural Improvements	X		X		X	
Range Nonstructural Improvement Maintenance		X	X			X
Range Structural Improvements	X		X		X	
Range Structural Improvement Maintenance		X	X			X
Range Administration and Management	X	X	X			X
Timber Planning and Inventory		X		X		X
Silvicultural Examination and Prescription	X		X			X
Reforestation	X		X		X	
Timber Stand Improvement	X		X		X	
Timber Sale Preparation	X		X			X
Timber Harvest Administration	X		X			X
Genetic Forest Tree Improvement Program		X		X	X	
Water, Soil, and Air Inventories		X		X	X	
Water, Soil, and Air Planning		X		X		X
Watershed and Soil Improvements	X		X		X	
Watershed, Soil, and Air Administration		X		X		X
Resource Inventory Reports		X		X	X	
Water Rights Management		X		X		X
Resource Improvement Maintenance		X	X			X
Monitoring		X		X		X
General Technical Inventory & Evaluation		X		X	X	
Site-Specific Technical Investigations		X		X	X	
Processing of Site-Specific Development Proposals		X		X		X
Administration of Operations		X		X		X
Contests, Hearings, and Appeals		X		X		X

TABLE B-10 (continued)
COSTS CONSIDERED IN ECONOMIC EFFICIENCY ANALYSIS

Cost Item	Inside FORPLAN	Outside FORPLAN	Significant Variation	Insignificant Variation	Capital Investment	Operations and Maintenance
Reserved and Outstanding Rights		X		X		X
Youth Conservation Corps		X		X		X
Senior Employment Program		X		X		X
Special Use Management, Licenses and Permits		X		X		X
Withdrawals, Modifications, and Revocations		X		X		X
Property Boundary Locations		X		X		X
Property Boundary and Corner Maintenance		X		X		X
Other Land Title Claims Management and Encroachment			X		X	X
Landownership Planning		X		X		X
Land Exchange, Equalization, Acquisition		X		X	X	
Land Transfers		X		X		X
Right-of-Way Acquisition		X		X		X
Right-of-Way Cost-Share Agreements		X		X		X
Forest Level Planning		X		X		X
Transportation System Planning and Inventory	X		X	X		
Preconstruction Roads, Bridges and Culverts		X	X		X	
Construction Engineering Roads, Bridges and		X	X		X	
Road Construction		X		X	X	
Road Reconstruction		X		X	X	
Road Maintenance Levels 1,2,3,4, and 5		X		X		X
FA&O Construction/Reconstruction		X		X	X	
FA&O Facility Maintenance		X		X		X
Dam Administration		X		X		X
Timber Purchaser Road Construction/ Reconstruction	X	X	X		X	
Fire Management Planning/Analysis and Prevention		X		X		X
Fire Detection		X		X		X
Primary Initial Attack Forces		X		X		X
Secondary Attack Forces		X		X		X
Initial Attack Fire Suppression Action		X		X		X
Treatment of Natural Fuels		X		X	X	
Aerial Platform		X		X		X
Law Enforcement		X		X		X
Law Enforcement (Cooperative)		X		X		X
Line Management		X		X		X
Program Support		X		X		X
Common Services		X		X		X
**Resource Coordination[1/]		X	X			X

1/Resource coordination included in various resource programs (e g. recreation, wildlife, etc.) needed to produce the annual programmed timber harvest in an environmentally acceptable manner

TABLE B-11
VARIABLE COSTS USED WITHIN THE FORPLAN MODEL

FORPLAN General Cost Category	Units	Cost Range
Reforestation (Planting)	$/acre	176-267
Site Preparation	$/acre	90
Precommercial Thinning	$/acre	45-89
Timber Sale Preparation and Administration	$/MCF	37
Logging	$/MCF	572-826
Local Road Construction/Reconstruction		
Construction	$/mile	16,600
Reconstruction	$/mile	14,000
Unroaded areas	$/mile	16,000-21,000
Range Improvement and Maintenance	$/AUM	30-16.67

D. BENEFITS CONSIDERED FOR ECONOMIC EFFICIENCY ANALYSIS

This section describes both the priced and nonpriced benefits which were incorporated in the economic efficiency analyses for each benchmark and alternative considered during the development of the Final Environmental Impact Statement. Resource outputs to which dollar values were assigned constitute the priced benefits included in the Present Net Value calculations Like all of the costs included in the analyses, benefits incurred during the planning horizon were incorporated in the Present Net Value calculations. The economic efficiency analysis for each alternative also considered nonpriced benefits. Nonpriced benefits are outputs for which there is no available market transaction evidence and no reasonable basis for estimating a dollar value commensurate with the market values associated with the priced outputs A subjective qualitative value must be attributed to their production Conceptually, addition of the nonpriced benefits to Present Net Value is used to derive the net public benefits associated with each alternative. Both priced and nonpriced outputs and their associated values will be summarized below. More-detailed documentation of the specific values and the process used to develop them can be found in the Supervisor's Office.

1. Priced Benefits Considered

Priced benefits fall into one of two categories: market and nonmarket (assigned). Market values constitute the unit price of an output normally exchanged in a market after at least one stage of production, and are expressed in terms of what people are willing to pay as evidenced by market transactions Nonmarket values constitute the unit price of a nonmarket output not normally exchanged in a market at any stage before consumption, and thus must be computed from other economic information (Forest Service Manual 1970 5). They are valued in terms of what reasonable people would be willing to pay (above participation costs) rather than go without the output In either case, the values are theoretically commensurate and appropriate for inclusion in Present net value calculations.

The resources for which values were estimated on the Malheur National Forest consisted of timber, range, anadromous fish, watershed condition, and developed/dispersed and fish-and-wildlife-oriented recreation. Timber and range were the only resources to which market prices were assigned in FORPLAN; commercial anadromous fish market prices were used in the spreadsheet. Nonmarket prices were used in the spreadsheet for all other resources. The process for deriving each of the values will be briefly explained in the following sections.

a Timber Resource Benefit Values

On the Malheur National Forest, the process for calculating timber resource benefit values was based on average mill values and logging costs supplied by the Regional Office in the April 27, 1984, direction package. The average mill value by species was adjusted by the Forest average logging cost (adjusted upwards for timber on slopes greater than 35 percent) to express the timber benefit values at time of harvest (i.e. stumpage) and reflect the increased logging costs required for steeper slopes.

All calculations were performed in terms of constant 1982 dollars. Also, since most of the source data was expressed in terms of dollars per thousand board feet, it was necessary to convert these to dollars per thousand cubic feet in the process. The species-specific values were further refined by 4-inch diameter classes based on stumpage valuation and price per diameter relationships developed by the Pacific Northwest Forest and Range Experiment Station. The stumpage values for individual species were used to generate working group stumpage values; essentially, the predominant species in the stand (i.e. greater than 50 percent) dictates the stumpage value used in FORPLAN. However, for the mixed conifer working group benefit values, the species mix was assumed to be 50 percent white fir/50 percent Douglas-fir

Table B-12 displays the characteristics which cause changes in the timber benefit values of existing and regenerated stands. The entire process that was followed in developing timber benefit values is explained in detail in the Forest planning records, on file in the Supervisor's Office.

b. Range Resource Benefit Values

The range outputs represent the amounts of forage permitted to be grazed and is measured in units of animal unit months. Animal unit month values were calculated as the value of the marginal product of an animal unit month in the production of a marketable animal. The Forest Service entered into a cooperative agreement with the USDA Economic Research Service to develop livestock enterprise budgets for each National Forest (Gee, 1981). The Ranch Budget Approach was used for the analysis. Because Forest animal unit months are not actually priced in a free competitive market, the calculated price is an estimate of market value First, returns from all ranch products were determined; then, all costs of production were subtracted. The remaining returns plus the cost of operations on National Forest lands became the residual value of the Animal Unit Month The residual value of an animal unit month to ranch livestock production is comparable to conversion surplus timber values Based on the information provided in the RPA 1985 Program analysis for the Draft Environmental Impact Statement, and a Regional Office letter (2340, September 30, 1983), the animal unit month value for the Malheur National Forest in 1982 dollars is $14 02

TABLE B-12
CHARACTERISTICS AFFECTING STUMPAGE VALUE DIFFERENTIALS

Existing Stands

Slope - Two Categories (0 to 35 percent) (greater than 35 percent)

Commercial/Precommercial Thin Opportunity

Regeneration Harvest Opportunity

Overwood Removal Opportunity

Working Group Assigned (i e., Species Mix)

Site Productivity Class (i.e., low site)

Regenerated Stands

Slope - Two Categories (0 to 35 percent) (greater than 35 percent)

Working Group Assigned (i e , Species Mix)

Site Productivity Class (i e., low site)

c. Anadromous Fish and Watershed Condition

The value used for anadromous fish (commercial harvest) was among those stipulated in the Regional Office direction package of April 27, 1984. Although anadromous fish use does not occur within the Forest boundary, the Forest does provide significant habitat for the fisheries resource Thus, the values for both sport fishing and commercial harvesting were used. The values for watershed condition, specifically the values for maintained water quality and improved water quality, were also contained in the Regional Office direction package referenced above.

d Wildlife and Recreation Benefit Values

The non wildlife-related recreation and wilderness outputs represent the amount of use consumed on the Forest and are measured in terms of recreation visitor days. The wildlife- and fish-related recreation use is measured in terms of wildlife and fish user days. Values used for the priced outputs were derived directly from the 1985 Resource Planning Act Program assessment. The following discussion is a summary of the write-up found in Appendix F of the 1985 Resource Planning Act Final Environmental Impact Statement.

The development of recreation, wilderness, and wildlife values for the 1985 Resource Planning Act Program analysis consisted of two steps: (1) development of recreation and wildlife benefit values by activity per recreation visitor day or wildlife and fish user day; and (2) adjustment of values to reflect standard and less-than-standard levels of management The Malheur National Forest used only values from the standard level.

The Resource Evaluation Group at the Rocky Mountain Forest and Range Experiment Station conducted an extensive literature search to develop the 1985 activity values for recreation. Benefit values for recreation, wilderness, and wildlife activities were developed from recent travel cost models and contingent valuation research (Loomis, 1982) Forest Service and academic specialists reviewed research and activity values and adjusted the initial values to achieve methodological consistency to apply them to regional conditions. The recreation visitor day values by recreation activity generated by the study can be found in Table F.4 of the 1985 Resource Planning Act Final Environmental Impact Statement.

For program evaluation purposes, the values were subsequently adjusted downward because:

- The travel-cost method represents a total willingness-to-pay. Other resource values in the Resource Planning Act evaluation represent market price or value of the marginal product. Consequently, the willingness-to-pay values were adjusted in an effort to make recreation values more compatible with values used for other resource outputs.

- The travel-cost method estimates values on a site-by-site basis. The method does not address the question of whether regionally or nationally a given quantity of recreation visitor days will, in fact, be consumed if the price were changed

- Travel-cost studies are typically done at higher-quality sites, do not take into account substitutes to individual sites, and do not accurately measure trip length, consequently, values from the studies may be on the high side when applied to average situations on a region-wide basis

In response to the first concerns, values were adjusted based on the relationship between the proportion of recreation provided by the Forest Service and estimates of an average nationwide demand elasticity for outdoor recreation Nationally, roughly a 5 percent increase in price will result in a 1 percent decrease in quantity demanded (Lewis, 1977) In 1982 the Forest Service provided 7-1/2 percent of all outdoor recreation Consequently, there will be a 5 percent decrease in price for each percent of the 7-1/2 percent Forest Service market share or a total decrease of 37 5 percent for clearing the market Therefore, the initial willingness-to-pay values were reduced 37 5 percent for use in comparing resource allocation choices

The final values used were assigned to the most significant recreation uses occurring on the Forest. These values, along with the anadromous fish and watershed values, are displayed in Table B-13 The recreation values are expressed in terms of the Recreation Opportunity Spectrum activity categories in accordance with the way they were developed and tracked during the process of analyzing alternatives.

TABLE B-13
1985 RESOURCE PLANNING ACT BENEFIT VALUES (1982 dollars)

Anadromous Fish and Watershed Values	Units	Value
Anadromous Fish Commercial Harvest	$/MLBS	1,050.00
Improved Water Quality	$/Acre-Foot	1.40
Maintained Water Quality	$/Acre-Foot	.20
Recreation Values		
Wilderness - Primitive Use	$/RVD	17 50
Wilderness - Semi-Primitive Non-Motorized	$/RVD	17 50
Primitive Use	$/RVD	11 25
Semi-Primitive Non-Motorized	$/RVD	13.25
Semi-Primitive Motorized	$/RVD	12.13
Roaded Natural	$/RVD	9.38
Rural	$/RVD	7.56
Urban	$/RVD	3.85
Big-game Hunting	$/WFUD	30 00
Resident Fishing	$/WFUD	15.00
Anadromous Sport Fishing	$/WFUD	33.00

2. Nonpriced Outputs Considered

The calculation of Present Net Value enables the comparison of alternatives with regard to their output levels for priced resources and their efficiency in producing them. However, other factors also influence the decision making process. In some cases, the importance of nonpriced benefits, for which it is impossible to assign monetary values, can outweigh the advantages of producing higher levels of priced outputs. The importance of the need to consider these subjectively valued benefits in Forest management decision making is addressed in the National Forest Management Act Regulations which charge the Forest Service with identifying the alternative which comes nearest to maximizing net public benefits (36 CFR 219.12(F)).

Net public benefits represent the overall value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs), whether or not the costs and benefits can be quantitatively valued. (36 CFR 219.3). Net public benefits include both priced and nonpriced resource outputs, less all costs associated with managing the area. As stated earlier, all priced outputs and all costs associated with managing the Forest are included in the calculation of Present Net Value The net subjective values of the nonpriced outputs must be added in order to arrive at the overall net public benefit of an alternative. Some of the most important nonpriced benefits addressed during the Malheur National Forest planning process include the following (1) Local Economic Stability (2) Visual Quality in Major Corridors (3) Old growth Timber (for wildlife habitat) (4) Roadless Areas (5) Elk Winter Range (6) Riparian Areas and Water Quality

The outputs and effects listed above are influenced to a large degree by decisions regarding management of the Forest. Several issues and concerns identified at the outset of the planning process focused on outputs and effects considered as nonpriced outputs. It is impossible to measure their value in dollar terms comparable to market values The values must be subjectively determined.

The provision for many of the nonpriced benefits is achieved by applying constraints to the production of priced outputs (e g , timber harvesting constraints in FORPLAN) The constraints usually result in a decrease in the Present Net Value of the priced outputs to which the constraints were applied. Subjective judgments are then necessary to assess whether benefits of producing the nonpriced outputs exceed the opportunity costs associated with producing fewer priced outputs If after analyzing a series of constraint levels, a Present Net Value tradeoff induced by the provision of a particular level of constraint for a nonpriced output is judged acceptable, then a positive contribution to net public benefits has resulted and the alternative is more efficient.

The nonpriced outputs considered during the development and evaluation of alternatives are discussed below. While the quantitative dollar values of each cannot be determined, nonpriced outputs can generally be evaluated by examining such quantitative indicators as acres of appropriate allocations, resource inventories, or timber production related activities and outputs

a. Local Economic Stability

The residents of Grant and Harney counties are especially dependent upon the Malheur National Forest. The Forest is both directly and indirectly responsible for thousands of area jobs, millions of dollars of personal income, and sizeable contributions to local government through the 25 percent payments to counties which support local road and school programs The Forest's importance to the local communities is based primarily on its timber program which provides most of the timber processed locally The range program is also important to local community stability, as many permittees are dependent upon Forest-produced forage. Recreation opportunities are widespread on the Forest, and activities such as big-game hunting attract people, which augments the local retail trade

b Visual Quality in Major Corridors

While the value of visual quality in major travel corridors is not directly included in the Present Net Value calculations, its value is indirectly represented through the consideration of recreation as a priced benefit. The provision of positive visual experiences is assumed to have a direct relationship to the quantity and quality of recreation on the Forest. A large number of people benefit from the visually appealing scenery. Two principal highways and several high-standard Forest roads pass through the Forest and people who drive on these roads pass through some high-quality scenic areas People who live in or around the Forest enjoy the scenic qualities associated with the forested mountain environment Experiences are not counted as recreation visitor days, because the benefits the people receive are not measurable in dollar terms.

Each alternative varies in emphasis on meeting inventoried visual quality objectives by proposing different corridor assignments. Emphases can be measured in terms of acres of retention and partial retention visual quality objectives which are being met through the implementation of an alternative.

c. Old growth

During the past decade, there has been a growing interest in old growth, apparently brought about by an awareness that unaltered old-growth stands are diminishing both in size and in number. One reason frequently given for retaining old-growth timber is to meet wildlife needs, but the desire apparently goes beyond this. On the Malheur National Forest, there is no wildlife species that has been identified as requiring only old-growth timber conditions, although some species require conditions that are best represented in old-growth stands. People also want old growth for the recreational enjoyment it provides, and for aesthetic and other qualities such as the size and age of its trees. Those opposed to the retention of old-growth conditions cite their concern for the loss of wood production and often prefer that land be converted to rapidly growing timber stands These conflicting desires are the basis of the old-growth issue

d Roadless Areas

On the Malheur National Forest, 18 roadless areas were inventoried in RARE II; Appendix C fully details these areas and the treatment of these areas by alternative. In general, as remaining roadless areas are roaded and developed for other uses, there are fewer opportunities for semiprimitive and primitive recreation experiences Furthermore, as more and more roadless areas are either developed or designated as wilderness, future generations will have fewer options regarding how to best manage them to meet changing needs. To the extent that retaining roadless areas in undeveloped conditions does not overly restrict the efficient production of priced outputs, both the recreation diversity and the future options which they offer are considered a nonpriced benefit

e. Elk Winter Range

The Malheur National Forest provides habitat for a significant local elk population which is currently increasing. Although elk production from the Forest is valued (priced as wildlife and fish user days for big-game hunting) indirectly as a recreational activity, there are nonpriced benefits associated with the provision of elk winter range. The Oregon Department of Fish and Wildlife and owners of adjacent private land (which elk use heavily in harsh winters) view the provision of elk winter range by the Forest as highly beneficial. The provision of winter range by the Forest through vegetative manipulation can result in healthier elk populations and less impact on adjacent land.

f Riparian Areas/ Water Quality

The Malheur National Forest has provided forage for many grazing permittee operations for many years. As a result, some riparian areas have been degraded by livestock use and are in need of rehabilitation Clean water is another commodity of Forest management that cannot be priced directly. Instead, an indicator of water quality, namely sediment yield, is used to reflect changes in the types and magnitude of Forest activities In the analysis, sediment production of the alternatives is evaluated in relative terms against the Minimum Level Benchmark. The Minimum Level Benchmark sediment yield reflects the background geologic sediment production level for the Malheur National Forest